

BEST AVAILABLE COPY RECEIVED
CENTRAL FAX CENTER

Application No.: 10/666,615

MAR 08 2007

Case No.: 58354US002

Amendments to the Claims:

The following Listing of Claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1-5. (Cancelled)

6. (Currently Amended) A method for making a glass-ceramic, the method comprising heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 50 percent by weight Al_2O_3 , based on the total weight of the glass, REO, ZrO_2 , and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, [[wherein the glass comprises ZrO_2 ,]] and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 .

7. (Cancelled)

8. (Previously Presented) A method for making a glass-ceramic, the method comprising heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 40 percent by weight Al_2O_3 , based on the total weight of the glass, REO, at least 20 percent by weight ZrO_2 , based on the total weight of the glass, and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 .

9-10. (Cancelled)

Application No.: 10/666,615

Case No.: 58354US002

11. (Previously Presented) A method for making a glass-ceramic, the method comprising heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 50 percent by weight Al_2O_3 , at least 30 percent by weight REO, and at least 10 percent by weight ZrO_2 , based on the total weight of the glass, and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 .

12-34. (Canceled)

35. (Previously Presented) A method for making abrasive particles, the method comprising heat-treating glass particles to convert at least a portion of the glass to crystalline ceramic to provide glass-ceramic abrasive particles, the glass comprising at least 50 percent by weight Al_2O_3 , based on the total weight of the glass, REO, ZrO_2 , and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 .

36. (Canceled)

Application No.: 10/666,615

Case No.: 58354US002

37. (Previously Presented) A method for making abrasive particles, the method comprising heat-treating glass particles to convert at least a portion of the glass to crystalline ceramic to provide glass-ceramic abrasive particles, the glass comprising at least 35 percent by weight Al_2O_3 , based on the total weight of the glass, REO, at least 20 percent by weight ZrO_2 , based on the total weight of the glass, and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 .

38-39. (Canceled)

40. (Previously Presented) A method for making abrasive particles, the method comprising heat-treating glass particles to convert at least a portion of the glass to crystalline ceramic to provide glass-ceramic abrasive particles, the glass comprising at least 50 percent by weight Al_2O_3 , at least 30 percent by weight REO, at least 10 percent by weight ZrO_2 , based on the total weight of the glass, and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 .

41-61. (Canceled)

62. (Previously Presented) The method according to claim 6, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 1.5 as compared to the comparative glass-ceramic.

Application No.: 10/666,615

Case No.: 583541JS002

63. (Previously Presented) The method according to claim 6, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 2 as compared to the comparative glass-ceramic.

64. (Previously Presented) The method according to claim 6, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 3 as compared to the comparative glass-ceramic.

65. (Previously Presented) The method according to claim 6, wherein the REO is at least one of Gd_2O_3 , La_2O_3 , or Nd_2O_3 .

66. (Currently Amended) A [[The]] method [[according to claim 6, further comprising]] of making abrasive particles, the method comprising:

heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 50 percent by weight Al_2O_3 , based on the total weight of the glass, REO, ZrO_2 , and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 ; and

crushing the glass-ceramic to provide the abrasive particles.

67. (Previously Presented) The method according to claim 66, further comprises grading the abrasive particles to provide a plurality of particles having a specified nominal grade.

68. (Currently Amended) A [[The]] method [[according to claim 6, further]] of making an abrasive article, the method comprising:

heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 50 percent by weight Al_2O_3 , based on the

Application No.: 10/666,615

Case No.: 58354US002

total weight of the glass, REO, ZrO₂, and at least one of Nb₂O₅ or Ta₂O₅, wherein the glass contains not more than 10 percent by weight collectively As₂O₃, B₂O₃, GeO₂, P₂O₅, SiO₂, TeO₂, and V₂O₅, based on the total weight of the glass, and wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb₂O₅ and Ta₂O₅;

crushing the glass-ceramic to provide abrasive particles; and
incorporating the abrasive particles into an abrasive article.

69. (Previously Presented) The method according to claim 6, wherein the glass-ceramic has an average hardness of at least 15 GPa.

70. (Previously Presented) The method according to claim 6, wherein the glass-ceramic has an average hardness of at least 17 GPa.

71. (Previously Presented) The method according to claim 6, wherein the glass-ceramic has an average hardness of at least 18 GPa.

72. (Previously Presented) The method according to claim 6, wherein the glass-ceramic has an average hardness of at least 19 GPa.

73. (Previously Presented) The method according to claim 8, wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass by at least a factor of 1.5 as compared to the comparative glass-ceramic.

74. (Previously Presented) The method according to claim 8, wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass by at least a factor of 2 as compared to the comparative glass-ceramic.

Application No.: 10/666,615

Case No.: 58354US002

75. (Previously Presented) The method according to claim 8, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 3 as compared to the comparative glass-ceramic.

76. (Currently Amended) A [[The]] method [[according to claim 8, further comprising]] of abrasive particles, the method comprising:

heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 40 percent by weight Al_2O_3 , based on the total weight of the glass, REO, at least 20 percent by weight ZrO_2 , based on the total weight of the glass, and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 ; and

crushing the glass-ceramic to provide the abrasive particles.

77. (Previously Presented) The method according to claim 76, further comprises grading the abrasive particles to provide a plurality of particles having a specified nominal grade.

78. (Currently Amended) A [[The]] method [[according to claim 76 further comprises]] of making an abrasive article, the method comprising:

heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 40 percent by weight Al_2O_3 , based on the total weight of the glass, REO, at least 20 percent by weight ZrO_2 , based on the total weight of the glass, and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a

Application No.: 10/666,615

Case No.: 58354US002

comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of
 Nb_2O_5 and Ta_2O_5 ;

crushing the glass-ceramic to provide the abrasive particles; and
incorporating the abrasive particles into an abrasive article.

79. (Previously Presented) The method according to claim 8, wherein the glass-ceramic has an average hardness of at least 15 GPa.

80. (Previously Presented) The method according to claim 8, wherein the glass-ceramic has an average hardness of at least 18 GPa.

81. (Previously Presented) The method according to claim 8, wherein the glass-ceramic has an average hardness of at least 19 GPa.

82. (Previously Presented) The method according to claim 11, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 1.5 as compared to the comparative glass-ceramic.

83. (Previously Presented) The method according to claim 11, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 2 as compared to the comparative glass-ceramic.

84. (Previously Presented) The method according to claim 11, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 3 as compared to the comparative glass-ceramic.

85. (Previously Presented) The method according to claim 11, wherein the REO is at least one of Gd_2O_3 , La_2O_3 , or Nd_2O_3 .

Application No.: 10/666,615

Case No.: 58354US002

86. (Currently Amended) A [[The]] method [[according to claim 11, further]] of making abrasive particles, the method comprising:

heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 50 percent by weight Al₂O₃, at least 30 percent by weight REO, and at least 10 percent by weight ZrO₂, based on the total weight of the glass, and at least one of Nb₂O₅ or Ta₂O₅, wherein the glass contains not more than 10 percent by weight collectively As₂O₃, B₂O₃, GeO₂, P₂O₅, SiO₂, TeO₂, and V₂O₅, based on the total weight of the glass, and wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb₂O₅ and Ta₂O₅; and crushing the glass-ceramic to provide the abrasive particles.

87. (Previously Presented) The method according to claim 86, further comprises grading the abrasive particles to provide a plurality of particles having a specified nominal grade.

88. (Currently Amended) A [[The]] method [[according to claim 86 further comprises]] of making an abrasive article, the method comprising:

heat-treating glass to convert at least a portion of the glass to crystalline ceramic and provide glass-ceramic, the glass comprising at least 50 percent by weight Al₂O₃, at least 30 percent by weight REO, and at least 10 percent by weight ZrO₂, based on the total weight of the glass, and at least one of Nb₂O₅ or Ta₂O₅, wherein the glass contains not more than 10 percent by weight collectively As₂O₃, B₂O₃, GeO₂, P₂O₅, SiO₂, TeO₂, and V₂O₅, based on the total weight of the glass, and wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb₂O₅ and Ta₂O₅; and crushing the glass-ceramic to provide abrasive particles; and incorporating the abrasive particles into an abrasive article.

89. (Previously Presented) The method according to claim 11, wherein the glass-ceramic has an average hardness of at least 15 GPa.

Application No.: 10/666,615

Case No.: 58354US002

90. (Previously Presented) The method according to claim 11, wherein the glass-ceramic has an average hardness of at least 18 GPa.

91. (Previously Presented) The method according to claim 11, wherein the glass-ceramic has an average hardness of at least 19 GPa.

92. (Previously Presented) The method according to claim 35, wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass by at least a factor of 1.5 as compared to the comparative glass-ceramic.

93. (Previously Presented) The method according to claim 35, wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass by at least a factor of 2 as compared to the comparative glass-ceramic.

94. (Previously Presented) The method according to claim 35, wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass by at least a factor of 3 as compared to the comparative glass-ceramic.

95. (Previously Presented) The method according to claim 35, wherein the REO is at least one of Gd₂O₃, La₂O₃, or Nd₂O₃.

96. (Previously Presented) The method according to claim 35, further comprises grading the glass-ceramic abrasive particles to provide a plurality of particles having a specified nominal grade.

97. (Currently Amended) A [[The]] method [[according to claim 35 further comprises]] of making an abrasive article, the method comprising:

heat-treating glass particles to convert at least a portion of the glass to crystalline ceramic to provide glass-ceramic abrasive particles, the glass comprising at least 50 percent by weight

Application No.: 10/666,615

Case No.: 58354US002

Al₂O₃, based on the total weight of the glass, REO, ZrO₂, and at least one of Nb₂O₅ or Ta₂O₅, wherein the glass contains not more than 10 percent by weight collectively As₂O₃, B₂O₃, GeO₂, P₂O₅, SiO₂, TeO₂, and V₂O₅, based on the total weight of the glass, and wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb₂O₅ and Ta₂O₅; and

incorporating the glass-ceramic abrasive particles into an abrasive article.

98. (Previously Presented) The method according to claim 35, wherein the glass-ceramic abrasive particles have an average hardness of at least 17 GPa.

99. (Previously Presented) The method according to claim 35, wherein the glass-ceramic abrasive particles have an average hardness of at least 18 GPa.

100. (Previously Presented) The method according to claim 35, wherein the glass-ceramic abrasive particles have an average hardness of at least 19 GPa.

101. (Previously Presented) The method according to claim 37, wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass by at least a factor of 1.5 as compared to the comparative glass-ceramic.

102. (Previously Presented) The method according to claim 37, wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass by at least a factor of 2 as compared to the comparative glass-ceramic.

103. (Previously Presented) The method according to claim 37, wherein the at least one of Nb₂O₅ or Ta₂O₅ is present in an amount sufficient to increase the rate of crystalline ZrO₂ formation from the glass by at least a factor of 3 as compared to the comparative glass-ceramic.

Application No.: 10/666,615

Case No.: 58354US002

104. (Previously Presented) The method according to claim 37, wherein the REO is at least one of Gd_2O_3 , La_2O_3 , or Nd_2O_3 .

105. (Previously Presented) The method according to claim 104, further comprises grading the glass-ceramic abrasive particles to provide a plurality of particles having a specified nominal grade.

106. (Currently Amended) A [[The]] method [[according to claim 104 further comprises]] of making an abrasive article, the method comprising:

heat-treating glass particles to convert at least a portion of the glass to crystalline ceramic to provide glass-ceramic abrasive particles, the glass comprising at least 35 percent by weight Al_2O_3 , based on the total weight of the glass, REO, at least 20 percent by weight ZrO_2 , based on the total weight of the glass, and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 ; and

incorporating the glass-ceramic abrasive particles into an abrasive article.

107. (Previously Presented) The method according to claim 37, wherein the glass-ceramic abrasive particles have an average hardness of at least 18 GPa.

108. (Previously Presented) The method according to claim 37, wherein the glass-ceramic abrasive particles have an average hardness of at least 19 GPa.

109. (Previously Presented) The method according to claim 40, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 1.5 as compared to the comparative glass-ceramic.

Application No.: 10/666,615

Case No.: 58354US002

110. (Previously Presented) The method according to claim 40, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 2 as compared to the comparative glass-ceramic.

111. (Previously Presented) The method according to claim 40, wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass by at least a factor of 3 as compared to the comparative glass-ceramic.

112. (Previously Presented) The method according to claim 40, wherein the REO is at least one of Gd_2O_3 , La_2O_3 , or Nd_2O_3 .

113. (Previously Presented) The method according to claim 40, further comprises grading the glass-ceramic abrasive particles to provide a plurality of particles having a specified nominal grade.

114. (Currently Amended) A [[The]] method [[according to claim 40 further comprises]] of making an abrasive article, the method comprising:

heat-treating glass particles to convert at least a portion of the glass to crystalline ceramic to provide glass-ceramic abrasive particles, the glass comprising at least 50 percent by weight Al_2O_3 , at least 30 percent by weight REO, at least 10 percent by weight ZrO_2 , based on the total weight of the glass, and at least one of Nb_2O_5 or Ta_2O_5 , wherein the glass contains not more than 10 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass, and wherein the at least one of Nb_2O_5 or Ta_2O_5 is present in an amount sufficient to increase the rate of crystalline ZrO_2 formation from the glass as compared to a comparative glass-ceramic made by heat-treating, in the same manner, the same glass free of Nb_2O_5 and Ta_2O_5 ; and

incorporating the glass-ceramic abrasive particles into an abrasive article.

115. (Previously Presented) The method according to claim 40, wherein the glass-ceramic abrasive particles have an average hardness of at least 18 GPa.

Application No.: 10/666,615

Case No.: 58354US002

116. (Previously Presented) The method according to claim 40, wherein the glass-ceramic abrasive particles have an average hardness of at least 19 GPa.

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.